Reducing Risk of Waterborne Illness in Public Water Systems: The Value of Information in Determining the Optimal Treatment Plan

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To ensure the safety of the nation's public drinking water supplies, drinking water regulations must be designed, promulgated, and implemented in the face of considerable uncertainty surrounding important variables such as dose–response relationship, occurrence of waterborne disease, and treatment effectiveness. Public community water systems (CWSs) may be quite heterogeneous in many of these variables, which are central to determining the socially optimal treatment plan for reducing risk of exposure to drinking water contaminants.

A model is developed to meet two objectives: (1) estimate the expected total social cost of various water treatment options under uncertainty and (2) estimate the value of obtaining additional information to reduce uncertainty surrounding key unknown parameters. This additional information allows for the socially optimal treatment option to be chosen, thereby lowering expected total social costs. The model is applied to the OGWDW Long Term 2 Enhanced Surface Water Treatment Rule (LT2), but is extendable to other contexts. For LT2, the model is used to determine whether additional treatment is needed to reduce the risk of *Cryptosporidium*, a waterborne disease caused by microscopic parasites, with typical health effects including diarrhea, nausea, and vomiting. The treatment options considered include no further action and installation of an ultraviolet (UV) disinfection system.

This work is a collaborative effort between a mathematical statistician employed by the U.S. Environmental Protection Agency (U.S. EPA) in the OGWDW and an economist who is an assistant professor at the University of Massachusetts-Boston and currently working in OGWDW, under the sponsorship of a Science and Technology Policy Fellowship from the American Association for the Advancement of Science (AAAS). Scientific knowledge, statistical techniques, and an economic decision-making model are combined to inform policy makers and water systems in choosing the most efficient treatment option to reduce risk of waterborne illness.